

On Australian Tridactylidae mainly from northern Australia

(Orthopteroidea, Saltatoria, Caelifera)*

By M. Baehr

Abstract

New records of several Australian Tridactylidae are presented and three new species of the genus *Xya* Latreille from the Northern Territory and from northwestern Australia are described: *Xya unicolor* spec. nov., *X. pseudo-muta* spec. nov., and *X. nanutarrae* spec. nov. A key is given to all Australian Tridactylidae. Genus *Xya* is now represented in Australia by five species and additional two subspecies of *X. muta* (Tindale). Four of the species are very closely related and might be looked upon as members of a superspecies, whose Northern Territory and Western Australian representatives were presumably derived from a northeastern stock during wet periods of glaciation epoch and were subsequently isolated in their faunal refugia when the climate became drier.

Introduction

The first comprehensive work on the Australian Tridactyline grasshoppers is that of TINDALE (1928). He described herein three of the four *Tridactylus* species known to him. The fourth species, *Tridactylus australicus* Mjøberg, was described only some years earlier in 1913. Since Tindale's work few has been added to the knowledge of this small group (see KEY 1970, 1974), apart from the rather recent review of GÜNTHER (1978). Herein Günther revised the Australian species basing especially on the rich material in the Australian National Insect Collection (CSIRO), mostly collected rather recently in northern parts of Australia. Günther in his revision synonymized Tindale's species *Tridactylus tantillus* and *T. musicus* with *T. australicus* Mjøberg and he described an additional species, *T. smithersi*, two additional subspecies of *T. mutus* Tindale, and two species of the genus *Dentridactylus* Günther. Later on GÜNTHER (1980) transferred *Tridactylus mutus* and *T. smithersi* to the genus *Xya* Latreille which is mainly distinguished by the very short posterior tarsus and the denticulate posterior tibia (GÜNTHER 1979). Hence five species and two additional subspecies of Tridactylidae are now known from Australia. Distribution of most species, however, is still unsatisfactorily known, because few collections have been made in northwestern Australia and virtually nothing is known from western and southwestern parts of Western Australia.

The two known Australian *Xya* species are morphologically well separated and may be easily distinguished by the lack (*X. smithersi*) or the presence of the leaf-like spurs on the posterior tibia (*X. muta*). *Tridactylus australicus* seems to occupy whole northern Australia, while *Xya muta* occurs in several, morphologically well separated subspecies throughout eastern, central and far northern Australia. *X. smithersi* is thus far known only from a single locality in the northern part of Northern Territory, and the two species of *Dentridactylus* are recorded from a single locality each in the mountains of southern New South Wales and the Australian Capital Territory, respectively.

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During a travel through northern and northwestern Australia in November-December 1984 I had the opportunity to collect a large number (more than 150 specimens) of Tridactylidae at several localities throughout northern and northwestern Northern Territory and northwestern Australia as far south as Ashburton River south of Hamersley Range. This collecting work led to a remarkable enlargement of the range of some species, as well as to the discovery of new species.

Acknowledgements

I wish to express my thanks to Dr. T. Kronstedt (Stockholm) and Dr. D. C. F. Rentz (Canberra) for the kind loan of types and specimens. At this place I also want to thank once more the authorities of the Deutsche Forschungsgemeinschaft (DFG) for support of this study by a travel grant. Thanks are also due to my wife for her most valuable aid in field work in the trying climatic conditions of the far North.

Measurements

Measurements were made under a stereo-microscope with an ocular micrometer using 16–64 x magnification. Body length was measured from apex of head to tip of cerci, length of tegmina and length of posterior wings from dorsal posterior border of pronotum, width of posterior femora at widest part, and distance of eyes at narrowest interspace between them.

Identification of species

Because genus *Xya* in Australia comprises several closely related species, species identification is difficult without consideration of ♂ and ♀ genitalia. Especially ♂ epiproct and phallus are rather characteristic in all species. Colour and pattern vary in some species to a considerable extent, but can be used with certain reservations. Shape of pronotum, relative length of tegmina and posterior wings is also fairly useful.

As several species are newly described in the present paper, a key to all Australian species is provided. With respect to species not mentioned in text, GÜNTHER'S (1978) key is followed. For identification of subspecies of *Xya muta* (Tindale) see GÜNTHER (1978, p. 239).

Key to the Australian species of Tridactylidae (partly adapted from GÜNTHER 1978)

- | | | |
|----|--|--|
| 1. | Posterior tibia without leaf-like tibial spurs | 2. |
| – | Posterior tibia with four and three leaf-like tibial spurs | 4. |
| 2. | Posterior tarsus elongate, longer than apical spines. Posterior tibia strongly dentate on upper rim | 3. |
| – | Posterior tarsus tiny, almost invisible. Posterior tibia weakly dentate | <i>Dentridactylus</i> Günther |
| 3. | Laterocaudal angle of pronotum white. Antenna 9-segmented. 10th abdominal tergite posteriorly not dentate | <i>Dentridactylus albisignatus</i> Günther |
| – | Laterocaudal angle of pronotum blackish. Antenna 10-segmented. 10th abdominal tergite posteriorly with two toothlike projections | <i>Dentridactylus keyi</i> Günther |
| 4. | Posterior tarsus elongate, longer than apical spurs | <i>Tridactylus australicus</i> Mjøberg |
| – | Posterior tarsus tiny, almost invisible | <i>Xya</i> Latreille |

- 5. Laterocaudal angle of pronotum sharp-edged, posterior border laterally straight or concave 6.
- Laterocaudal angle of pronotum rounded, posterior border laterally convex 7.
- 6. Posterior wings short, not surpassing abdomen. Body mottled or almost black; if black, then at least laterocaudal angle of pronotum largely whitish. ♂ epiproct narrow, clearly longer than wide, dorsally with two conspicuous denticles. *Xya muta* (Tindale)
- Posterior wings elongate, surpassing abdominal appendages. Body completely black, laterocaudal angle of pronotum at most with a faint, narrow, white border. ♂ epiproct wide, much wider than long, dorsal denticles inconspicuous *Xya unicolor* spec. nov.
- 7. Median parts of head and pronotum mottled. ♂ epiproct narrow, elongate, lateral borders strongly excised *Xypseudomuta* spec. nov.
- Median parts of head and pronotum unicolorous blackish. ♂ epiproct wide, trapezoidal, lateral borders barely excised *Xyananutarra* spec. nov.

Tridactylus australicus Mjøberg
(Fig. 6)

Mjøberg, 1913, p. 31
 CHOPARD 1926, p. 6
 TINDALE 1928, p. 41
 GÜNTHER 1978, p. 233; 1980, p. 166
Tridactylus tantillus Tindale, 1928, p. 38
 GÜNTHER 1978, p. 233; 1980, p. 166
Tridactylus musicus Tindale, 1928, p. 40
 GÜNTHER 1978, p. 233; 1980, p. 166

This is a common, rather variable species, distributed throughout whole northern Australia, and it is rather well documented in the collections. GÜNTHER (1978) correctly synonymized both Tindale's species with *T. australicus*, because in most distinguishing characters transitional specimens are at hand. However, Günther quoted that in eastern Australia the posterior tibia of this species normally bears 3 and 4 denticles, respectively, in northwestern Australia only 1–2 denticles. Judging from my numerous material from Northern Territory and northwestern Australia this is not correct, as most northwestern specimens possess also 3 and 4 denticles. Colour and pattern is extremely variable and changes from almost uniformly black to strongly mottled. This change may occur within the same local population. Flight ability and strong, though not geographical variation precluded presumably a subspecific differentiation of this wide-ranging species.

In some characters, however, e. g. structure of posterior tibia and comb on anterior femur always consisting of 10–12 flattened bristles in the apical 2/3 of lower surface, *T. australicus* shows little variation.

Distribution (Fig. 6):

According to GÜNTHER (1978) northern tropical Australia from Cape York Peninsula in northern Queensland through northern parts of Northern Territory to northwestern Australia north of Great Sandy Desert.

New records (146 specimens, all in Zoologische Staatssammlung München):

Northern Territory: 12 ♂♂, ♀♀, 1 km W. of Humpty Doo, 1.–5. XI. 1984 M. & B. Baehr, in Barber traps; 28 ♂♂, ♀♀, Fogg Dam, 5 km NW. of Coastal Plains Research Station, 1.–5. XI. 1984, M. & B. Baehr, in Barber traps; 5 ♂♂, ♀♀, West Alligator River, 60 km W. of Jabiru, 2.–4. XI. 1984, M. & B. Baehr, in Barber traps; 6 ♂♂, ♀♀, Malabinbandjy Billabong, 13 km S. of Jabiru, 2. XI. 1984, M. & B. Baehr, at light; 22 ♂♂, ♀♀, Magela Creek, 3 km N. of Mudginberry, 3. XI. 1984, M. & B. Baehr, at light; 1 ♂, 30 km S. of Pine Creek, 6. XI. 1984, M. & B. Baehr; 1 ♂, 17 km NE. of Willeroo, 8. XI. 1984, M. & B. Baehr, at light;

Western Australia: 45 ♂♂, ♀♀, Ord River near Ivanhoe, 11.–13. XI. 1984, M. & B. Baehr, at light and in Barber traps; 4 ♂♂, ♀♀, Ord River, 105 km N. of Hall's Creek, 15. XI. 1984, M. & B. Baehr, at light; 1 ♀, 108 km WSW. of Hall's Creek, 16. XI. 1984, M. & B. Baehr, at light; 5 ♂♂, ♀♀, Mary River, 115 km WSW. of Hall's Creek, 17. XI. 1984, M. & B. Baehr, at light and in Barber traps; 7 ♂♂, ♀♀, Fitzroy River near Fitzroy Crossing, 18.–20. XI. 1984, M. & B. Baehr, at light and in Barber traps; 1 ♂, 1 ♀, 1 juv., Windjana Gorge, 150 km E. of Derby, 21.–23. XI. 1984, M. & B. Baehr, in Barber traps.

Collecting circumstances and observations:

Specimens of *T. australicus* have been collected by the author principally using three methods: At light, in Barber traps exposed on sand-banks near pools in the bed of large rivers, and by catching from the borders of pools and rivers. This species which I found always fully winged is apparently a good flier, because in some localities specimens were caught at light in a distance of at least 200 meters from water. In one place the distance was at least two kilometers. The species lives as well on (in) the sandy banks of larger rivers (e. g. Ord River, Fitzroy River), as on muddy shores of seasonally dry rivers and creeks, and on pools, where specimens have been caught from the water surface and from between vegetation.

Xya muta (Tindale)

Tindale, 1928, p. 36 (*Tridactylus*)

GÜNTHER 1978, p. 238 (*Tridactylus*); 1980, p. 169

This is also a widely distributed species, ranging from southern South Australia to north Queensland and also into Central Australia and northeastern Northern Territory. Because most populations are flightless, *X. muta* splits into several well separated subspecies. Apart from development of wings and colour pattern, there are some minor differences in shape of ♀ subgenital plate and ♂ phallus between subspecies. From most other Australian *Xya* species it is distinguished by ♀ not possessing a stridulatory organ on tegmina and by ♂ epiproct medium-sized and with two rather conspicuous denticles. In all subspecies epiproct and paraproctal hooks are similar.

Xya muta muta (Tindale)

(Figs 1 a, 2 a, 7)

Tindale, 1928, p. 36 (*Tridactylus mutus*)

GÜNTHER 1978, p. 239 (*Tridactylus mutus mutus*); 1980, p. 170

The nominate subspecies is well distinguished by black colour with few white markings on inner border of eye and on lateral border of pronotum, by always reduced wings not or barely surpassing tegmina, by shape of ♂ phallus, and by nearly straight posterior border of ♀ subgenital plate.

Distribution (Fig. 7):

This subspecies is widely distributed in eastern Australia from southern parts of South Australia through Victoria, New South Wales to northern Queensland. GÜNTHER (1978) records also a locality in northern parts of Northern Territory. This specimen belongs perhaps to another subspecies.

New records (4 specimens):

South Australia: 3 ♂♂, 1 ♀, Wilpena Pound, Flinders Ranges, 25. XII. 1972, M. Baehr (Zoologische Staatssammlung München).

***Xya muta signata* (Günther)**
(Figs 1 b, 7)

Günther, 1978, p. 247 (*Tridactylus*); 1980, p. 170

Subspecies distinguished by posterior wings not surpassing tegmina, strongly mottled surface, different structure of ♂ phallus, and rather convex posterior border of ♀ subgenital plate.

Distribution (Fig. 7):

This subspecies is so far known from northeastern Northern Territory and northern Queensland. The Queensland record, however, is rather doubtful, the more, as it is based on juvenile specimens.

New records (1 specimen):

Northern Territory: 1 ♀, 75 km E. of Timber Creek. 9. XI. 1984, M. & B. Baehr (Zoologische Staatssammlung München).

Collecting observations:

Collected together with following species from water surface of a small, watering pool with densely grown, clayish border.

Note:

This record enlarges the range of this subspecies considerably to the west through northern parts of Northern Territory.

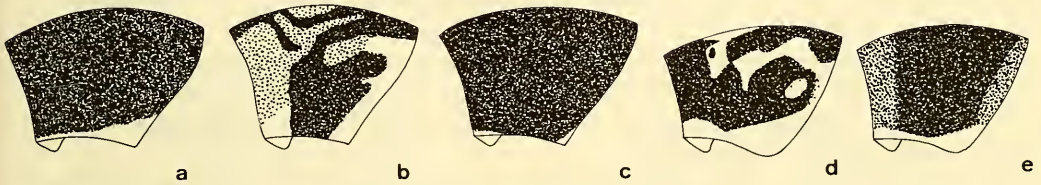


Fig. 1. Lateral view of pronotum: a *Xya muta muta* (Tindale); b. *Xya muta signata* (Günther); c. *Xya unicolor* spec. nov.; d. *Xya pseudomuta* spec. nov.; e. *Xya nanutarrae* spec. nov.

***Xya unicolor*, spec. nov.**
(Figs 1 c, 2 b, 3 a, 4, 8)

GÜNTHER 1978, p. 245 (*Tridactylus mutus deserticolus* var.; 1980, p. 170 (*Xya muta deserticola* var.)

GÜNTHER (1978) in a note following the description of a new subspecies *T. mutus deserticolus* mentions some specimens from extreme northern parts of Northern Territory which are morphologically similar, but are distinguished from that subspecies by ground colour black without any white markings apart from near inner border of eyes, and by fully developed, elongate wings. Günther looked upon these specimens as a colour variation of *X. muta deserticola* living in "northern areas of the Northern Territory which join to the known areal of *T. m. deserticolus*" (translated by author). The known areal of *X. muta deserticola*, however, is the Eyre Basin in South Australia and adjacent southern Northern Territory north to Alice Springs. Hence, the ranges of both populations virtually do not join, but there is a rather wide gap between them.

Differing pattern and full wing development, but above all different structure of ♂ genitalia justify to describe this northern population as an own new species.

Types:

Holotype: ♂, 16°12'S, 136°00'E, 6 km E. of Cow Lagoon, WSW. of Borooloola, Northern Territory, 15.IV.1976, Key, Balderson et al., "*Tridactylus mutus* Tindale var. det. K. K. Günther 1977 (Australian National Insect Collection, Canberra). – Paratypes: 1 ♂, Koongarra, N. T., 15 km E. of Mt. Cahill, 15.XI.1972, D. H. Coless, "*Tridactylus mutus* Tindale var. det. K. K. Günther (Australian National Insect Collection, Canberra); 1 ♀, Humpty Doo, N. T., 10.VI.1964, I. F. B. Common, "*Tridactylus mutus* Tindale var. det. K. K. Günther (Australian National Insect Collection, Canberra); 2 ♀♀, 75 km E. of Timber Creek, NT, 9.XI.1984, M. & B. Baehr (Zoologische Staatssammlung München).

Type locality:

Near Borooloola, northeastern Northern Territory.

Diagnosis:

Fully winged, black species, without white markings on pronotum and posterior femur, distinguished by wings surpassing apex of cerci, ♂ genitalia with conspicuously wide epiproct, and shape of ♀ subgenital plate.

Description:

Measurements: Length: ♂: 4.8–4.95 mm, ♀: 5.4–5.5 mm; length of pronotum: ♂: 1.05–1.1 mm, ♀: 1.2–1.23 mm; width of pronotum: ♂: 1.25–1.28 mm, ♀: 1.4–1.42 mm; length of tegmina: ♂: 1.35–1.45 mm, ♀: 1.65 mm; length of posterior wings: ♂: 3.6–3.65 mm, ♀: 4.1–4.15 mm; length of posterior femur: ♂: 2.8–2.9 mm, ♀: 3–3.05 mm; width of posterior femur: ♂: 1.03 mm, ♀: 1.04–1.05 mm; length of posterior tibia: ♂: 2.15–2.2 mm, ♀: 2.4–2.45 mm; length of basal segment of cercus: ♂: 0.48–0.5 mm, ♀: 0.52–0.53 mm; length of terminal segment of cercus: ♂: 0.19–0.21 mm, ♀: 0.21–0.22 mm; length of paraproctal stylus: ♂: 0.56–0.59 mm, ♀: 0.61–0.62 mm; width between eyes: ♂: 0.4–0.44 mm, ♀: 0.48–0.5 mm.

Colour: Surface rather dull black, only a very narrow stripe near eye, an extremely narrow border on laterocaudal angle of pronotum, and a spot on ventral border of tegmina white. Anterior and intermediate legs with some light spots. Also basal abdominal sternites largely, apical sternites narrowly white. ♀ subgenital plate largely dark.

Head: Surface microreticulate, with scattered punctures and sparse pilosity. Mouthparts of average size. Antennae short, 3rd segment more than 1.5× as long as 2nd, longer than 4th–6th segments. 7th–10th segments successively more elongate, terminal segment longest.

Pronotum: Posterior angles acute, lateral parts of posterior border straight to slightly concave like in *X. muta*.

Abdomen: Last tergite deeply notched, last sternite longer than wide, apex convex. Cerci slightly longer than paraproctal appendices, both densely bristled.

Tegmina: Elongate, reaching or surpassing middle of posterior femora. ♀ without sound-producing file, ♂ with about 25–30 plates on file. Posterior wings very elongate, complete, considerably surpassing apex of abdominal appendices.

Legs: Anterior femur rather elongate, comb consisting of about 15 flattened bristles, occupying almost whole lower rim. Tibia fairly narrow, apex with four fingers, median finger rather weak. Lateral border with 4–5 strong, curved bristles, lower surface densely setose. Tarsus 2-segmented, 1st segment with a ventral groove. Intermediate femur and tibia elongate, 1st segment of tarsus deeply incised and with hyaline pads. Posterior femur almost attaining apex of abdominal appendages. Tibia shorter than femur, with 3 lateral and 4 median lamellae. In front of lamellae with 4–5 strong serrations on each side of upper rim. Subapical spines rather short, inner about 1/3 of length of apical spurs. Spurs apically hooked and with short bristles. Apical spurs elongate, gently hooked and with some bristles near apex. Tarsus tiny, barely visible.

♂ genitalia: Cerci slightly surpassing paraproctal appendices. Epiproct very wide, considerably wider than long, with wide, anchor-shaped apex. Epiproct dorsally with two inconspicuous denticles.

Paraproctal hooks elongate. Tip of phallus divided, lamellae on cingular apodeme inconspicuous. Apodemes short, apically rounded.

♀ genitalia: Subgenital plate wide, apex not evenly rounded nor straight, but slightly oblique on each side. Incision at apex of subgenital plate very small.

Variation: Apparently little variation present. One ♂ with slightly shorter tegmina.

Distribution (Fig. 8):

Northern (tropical) parts of Northern Territory.

Material examined (5 specimens):

♂ holotype and 2♂♂ and 2♀♀ paratypes.

Collecting observations:

Thus far collected in April, June, and November. My specimens were caught from the densely grown border of a small clayish watering pool, together with a specimen of *X. muta signata* (Günther).

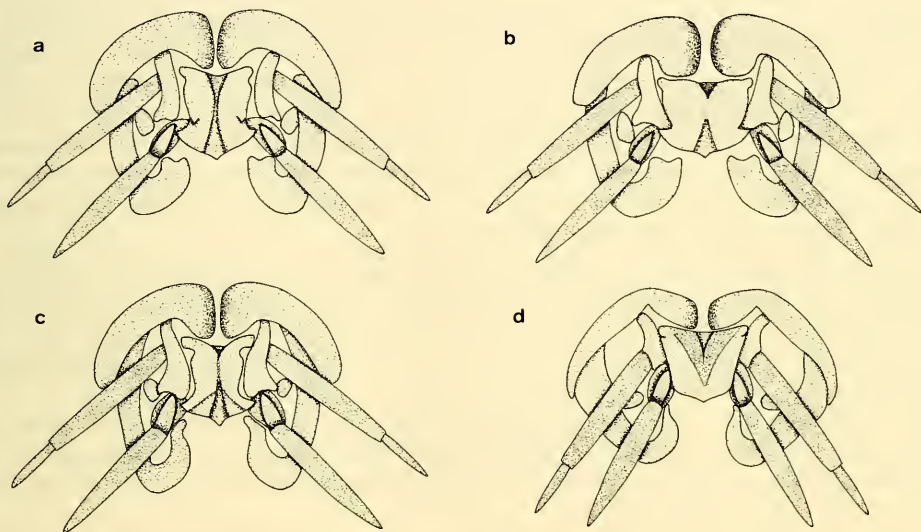


Fig. 2. ♂ genital segment: a. *Xya muta muta* (Tindale); b. *Xya unicolor* spec. nov.; c. *Xya pseudomuta* spec. nov.; d. *Xya nanutarrae* spec. nov.

Xya pseudomuta, spec. nov.

(Figs 1 d, 2 c, 3 b, 5, 8)

Types:

Holotype: ♂, Mary River, 115 km WSW. of Hall's Creek, Western Australia, 17. XI. 1984, M. & B. Baehr, Barber trap (Australian National Insect Collection, Canberra). — Paratype: 1 ♂, Denham River, 18 km S. of road crossing to Hall's Creek, W. A., 14. XI. 1984, M. & B. Baehr (Zoologische Staatssammlung München).

Type locality:

Mary River W. of Hall's Creek, Kimberley Division, northwestern Australia.

Diagnosis:

Mottled species with medium-sized posterior wings surpassing tegmina, though not reaching tip of abdomen; distinguished by very short metatarsus, obtuse posterior border of pronotum, and structure of ♂ epiproct and phallus.

Description:

Measurements (only ♂♂ available, holotype first): Length: 5.7, 4.78 mm; length of pronotum: 1.17, 1.12 mm; width of pronotum: 1.52, 1.34 mm; length of tegmina: 1.25, 1.16 mm; length of posterior wings: 1.7, 1.56 mm; length of posterior femur: 2.92, 2.8 mm; width of posterior femur: 1.24, 1.09 mm; length of posterior tibia: 2.75, 2.35 mm; length of basal segment of cercus: 1.35, 1.1 mm; length of terminal segment of cercus: 0.54, 0.51 mm; length of paraproctal stylus: 1.73, 1.6 mm; width between eyes: 0.54, 0.47 mm.

Colour: Whole body strongly mottled yellow-black, with some iridescent hue. Head: Inner border of eyes narrowly bordered with white, this border at place of narrowest distance between eyes considerably widened. Head dorsally with two white stripes from eye to anterior border of pronotum. Clypeus and labrum with white markings. Antennae brown. Pronotum with lateral borders widely whitish, anterior and posterior borders and middle with several large yellow spots. Abdomen dorsally piceous, ventrally dark with intersegmental membranes white, last sternite light. Tegmina largely greyish-white, apically brown, with some indistinct darker stripes. Posterior wings light, slightly infusate to apex. Anterior and intermediate legs conspicuously blotched, posterior femur with characteristic pattern. Femur dark, base and apex dorsally and ventrally in front of tibial articulation spotted with white. In first third three distinctive white spots or stripes one upon another: upper spot quadrate, median stripe elongate, lower spot wide, elongate, sometimes united with white ventral border of femur. Posterior tibia whitish, slightly infusate near apex.

Head: Surface strongly microreticulate and with scattered punctures. Sparsely pilose. Inner border of eyes converging to frons, dorsally rather angulate. Frons $1.5\times$ as wide as eye. Antennae short, 1st and 2nd segments short, 2nd only half as long as 3rd, 3rd longer than 4th–6th. 7th–10th segments successively more elongate, terminal segment longest.

Pronotum: Considerably wider than long, anterior border almost straight, lateral border gently concave, posterior angles rounded off, base laterally convex. Surface conspicuously microreticulate, sparsely pilose and coarsely punctate.

Abdomen: Last tergite deeply notched, last sternite longer than wide, apex convex. Cerci slightly longer than paraproctal appendices, both densely bristled.

Tegmina: Opaque, short, about half as long as posterior femur. Posterior border slightly bisinuate. Sound-producing file of ♂ present, short, occupying less than $\frac{1}{3}$ of length of tegmina, with about 20–25 plates. Posterior wings short, about $1.5\times$ as long as tegmina, rudimentary, only anterior, more sclerotized part present, vannus reduced.

Legs: Anterior femur rather elongate, comb consisting of about 15 flattened bristles, occupying almost whole ventral border. Tibia rather narrow, apex with four fingers, median finger weak. Lateral border with 4–5 strong, curved bristles, lower surface densely setose. 1st segment of tarsus with a ventral groove. Intermediate femur and tibia elongate, 1st segment of tarsus deeply incised ventrally and with hyaline pads. Posterior femur almost attaining apex of abdominal appendages. Tibia slightly shorter than femur, with 3 lateral and 4 median subapical lamellae. In front of lamellae with 4–5 strong serrations on each side of upper rim. Subapical spines rather short, inner about $\frac{1}{3}$ of length of apical spurs. Spurs apically hooked and with short bristles. Apical spurs very elongate, gently hooked and with some bristles near apex. Tarsus tiny, barely visible.

♂ genitalia: Epiproct narrow, elongate, with conspicuous anchor-shaped apex. Paraproctal hooks elongate, curved. Cerci slightly surpassing paraproctal appendices. Subgenital plate slightly shorter than wide, apically narrower and convexly rounded off. Phallus with characteristically divided tip and short, convex cingular lamellae. Apex of cingular apodeme wide.

♀ genitalia: Unknown.

Variation: Considerable variation of size, but otherwise, especially in ♂ genitalia, little variation noted.

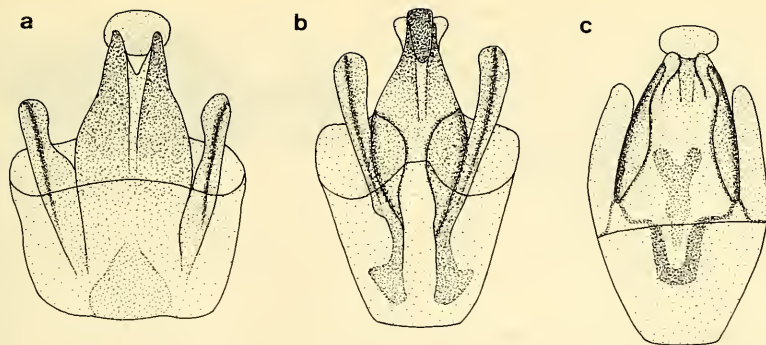


Fig. 3. ♂ phallus: a. *Xya unicolor* spec. nov.; b. *Xya pseudomuta* spec. nov.; c. *Xya nanutarrae* spec. nov.

Distribution (Fig. 8):

Northwestern Australia from near border to Northern Territory to northern fringe of Great Sandy Desert.

Material examined (3 specimens):

Apart from holotype and one ♂ paratype there is one juvenile specimen from Mary River (type locality) with short posterior tarsus which could also belong to this species.

Collecting circumstances and observations:

One specimen collected in Barber trap, exposed on the sandy bank near a pool in the bed of the dry Mary River in semidesert country. The paratype was captured by digging in the pure, coarse sand near a pool in the seasonally dry Denham River. This is apparently a sand-living species, occurring on bare sand-banks. These habits are in harmony with the strongly mottled pattern which matches well the surface of sand-banks.

Xya nanutarrae, spec. nov.

(Figs 1 e, 2 d, 3 c, 8)

Types:

Holotype: ♂, Ashburton River at Nanutarra Roadhouse, Western Australia, 6.XI.1984, in Barber trap, M. & B. Baehr (Australian National Insect Collection, Canberra). — Paratype: 1 ♂, same locality, same date (Zoologische Staatssammlung München).

Type locality:

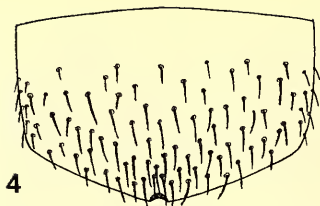
Ashburton River about 100 km SE. from mouth, Western Australia.

Diagnosis:

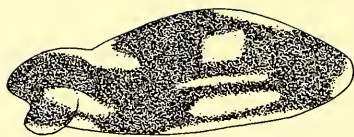
Species closely related to *X. muta*, distinguished by very small size, rounded posterior angles of pronotum, conspicuous pattern of posterior femur, and characteristic trapezoidal ♂ epiproct.

Description:

Measurements (only ♂ known): Length: 3.75–3.85 mm; length of pronotum: 0.92–0.94 mm; width of pronotum: 1.06 mm; length of tegmina: 1.1–1.12 mm; length of posterior wings: 1.5–1.52 mm; length of posterior femur: 2.4–2.43 mm; width of posterior femur: 0.85–0.88 mm; length of posterior tibia: 2.08–2.09 mm; length of basal segment of cercus: 0.43–0.44 mm; length of terminal segment of cercus: 0.16–0.17 mm; length of paraproctal appendices: 0.5–0.51 mm; width of head between eyes: 0.37–0.38 mm.



4



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Fig. 4. ♀ subgenital plate of *Xya unicolor* spec. nov. — Fig. 5. Posterior femur of *Xya pseudomuta* spec. nov.

Colour: Surface greenish-black, with strong iridescent tinge and few white spots. Legs mottled. Head: Eyes with narrow white border, border feebly widened at place of closest distance of eyes. Clypeus and labrum dark, mouthparts whitish, terminal segments of palpi infusate. Antennae dark. Pronotum with white spot at posterior angles, also lateral border narrowly and indistinctly white. Sometimes anterior and posterior borders feebly lighter than middle. Abdomen dorsally dark, ventral segments dark with posterior borders white. Last sternite white. Tegmina light brown with whitish areas. Posterior wings dirty white, apically infusate. Anterior and intermediate legs conspicuously blotched, rather light. Posterior femur with characteristic pattern. Base and apex dorsally and ventrally with white spots, in anterior third four white spots or stripes one upon another present. Dorsal rim with short white stripe; a rather quadrate spot beneath border; medially an elongate, narrow stripe; lower spot large, confluent with white ventral border of femur. Posterior tibia dirty white, infusate near apex.

Head: Surface conspicuously microreticulate and with scattered coarse punctures, sparsely pilose. Inner border of eyes converging to frons, dorsally rather angulate. Frons about $1.4\times$ as wide as eye. Antennae short and stout. 1st and 2nd segments short, 2nd half as long as 3rd, 3rd longer than 4th—6th, about $1.5\times$ as long as 4th segment. 7th—10th segments successively more elongate, terminal segment longest.

Pronotum: Wider than long. Anterior border barely convex, lateral border gently concave, posterior angles widely rounded off, posterior border convex throughout. Surface conspicuously microreticulate, coarsely punctate, and sparsely pilose.

Abdomen: Last tergite deeply notched, last sternite longer than wide, apex rounded off. Cerci considerably longer than paraproctal appendices, both densely bristled.

Tegmina: Opaque, about half as long as posterior femora. Posterior border slightly bisinuate. Sound-producing file in ♂ present in apical part of tegmen, short, inconspicuous, with about 20 plates. Posterior wings short, less than $1.4\times$ as long as tegmina, rudimentary, only anterior, more sclerotized part present, vannus reduced.

Legs: Anterior femur rather elongate, comb consisting of about 15 flattened bristles, occupying almost whole lower border. Tibia narrow, apex with four fingers, median finger weakly developed. Lateral border with 4—5 strong, curved bristles, lower surface densely setose, 1st tarsal segment with a ventral groove. Intermediate femur and tibia elongate, 1st tarsal segment ventrally deeply incised, with hyaline pads. Posterior femur very large in comparison to body proportions, almost attaining apex of cerci, rather slender. Tibia considerably shorter than femur, with 3 lateral and 4 median subapical lamellae. This part of tibia proportionally elongate. In front of subapical lamellae 4—5 strong serrations on each side of upper rim. Subapical spines short, about $\frac{1}{3}$ as long as very elongate apical spines, spines of almost equal size. Both pares of spines hooked at apex and with some bristles. Tarsus tiny, barely visible.

♂ genitalia: Epiproct wide, short, trapezoidal, apex not perceptibly widened, sides rather straight. Paraproctal hooks strongly curved. Cerci distinctly surpassing paraproctal appendices. Subgenital plate slightly longer than wide, narrowed and rounded to apex. Phallus with conspicuous hyaline plate

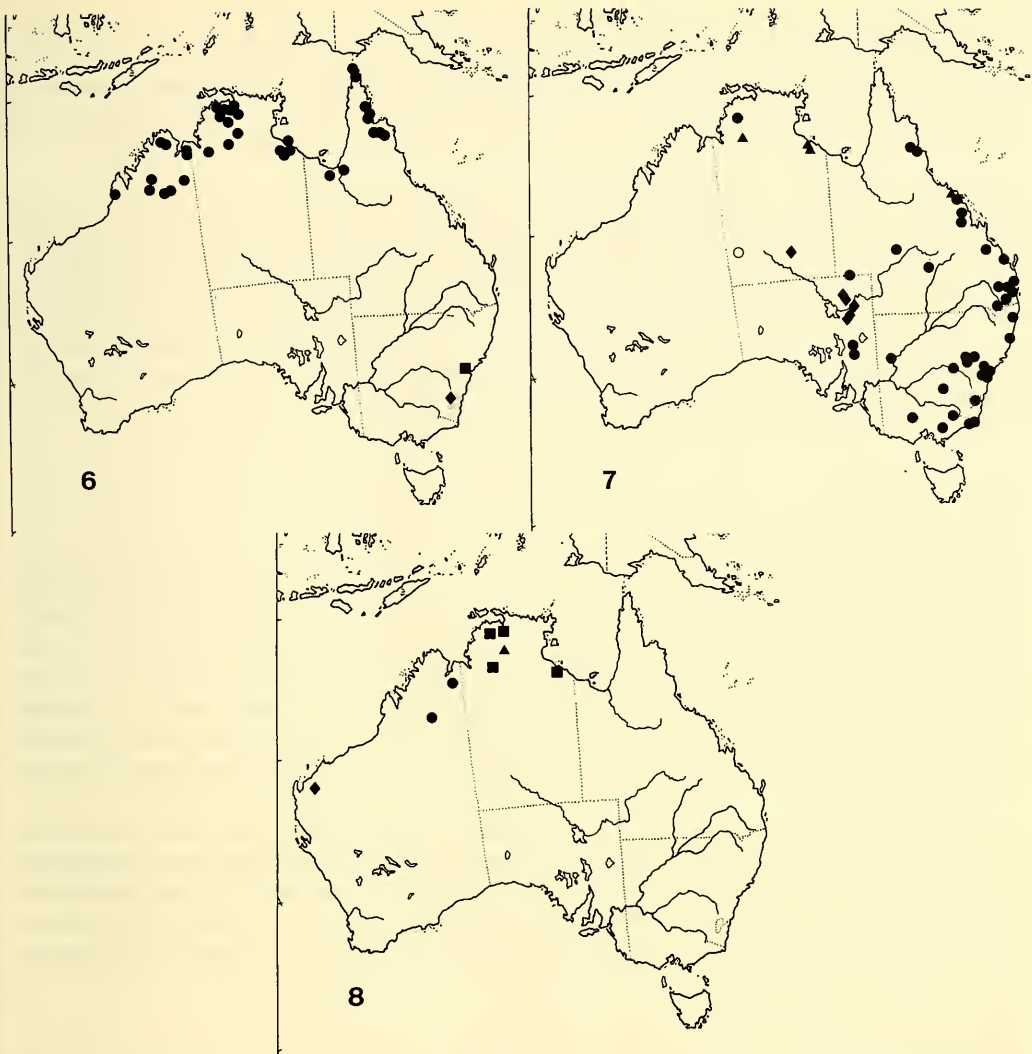


Fig. 6. Distribution of *Tridactylus australicus* Mjøberg: ●; *Dentridactylus keyi* Günther: ◆; and *Dentridactylus albisignatus* Günther: ■. — Fig. 7. Distribution of *Xya muta* (Tindale) and its subspecies: *Xya m. muta* (Tindale): ●; *Xya m. deserticola* (Günther): ◆; *Xya m. signata* (Günther): ▲. — Fig. 8. Distribution of *Xya smithersi* (Günther): ▲; *Xya unicolor* spec. nov.: ■; *Xya pseudomuta* spec. nov.: ●; and *Xya nanutarrae* spec. nov.: ◆.

at apex and with elongate, inconspicuous lamellae on cingular apodeme. Apex of cingular apodeme very wide, slightly sinuate.

♀ genitalia: Unknown.

Variation: Judging from few specimens available no considerable variation noted.

Distribution (Fig. 8):

Known only from lower Ashburton River south of Hamersley Range, Western Australia.

Material examined (2 specimens):

Only ♂ holotype and one ♂ paratype.

Collecting circumstances and observations:

Both known specimens captured in Barber traps exposed on a sandy bank near a small pool in the dry bed of Ashburton River. Apparently a sand-living species. Ashburton River is a large, almost constantly dry river within semidesert country. Thus far collected in December. This is perhaps the first *Tridactylus* species to be discovered in Western Australia south of Great Sandy Desert.

Note:

With exception of *Xya smithersi* (Günther) all Australian *Xya* species are apparently very closely related. *Xya unicolor*, for example, might be easily classed as a subspecies of *Xya muta*, as Günther did. But this procedure is inappropriate, because *X. unicolor* and *X. muta signata* occur in the same area and even at the same pool. Perhaps most Australian *Xya* species belong to a superspecies with more or less closely related taxa, distributed over most of Australia. Judging from ♂ genitalia, however, the subspecies (in Günther's sense) of *X. muta* seem more closely related one to another than any of the other taxa. Therefore these are provisionally described as species.

Discussion

The knowledge of the Australian *Tridactylus* fauna was in last years strongly increased, especially by GÜNTHERS (1978) revision. With regard to the present work now 8 species and additional 2 subspecies from 3 genera are known from Australia. Nevertheless, distribution of most species and subspecies, especially in the far North and in the West, is certainly insufficiently known, and likely additional species or subspecies may be discovered, when such remote areas are better worked. Any suggestions about species ranges and biogeography of Australian *Tridactylus* on the whole are therefore rather provisional. As has been demonstrated by the present work, above all distribution of genus *Xya* is not well known, and future collecting work should concentrate to western, especially southwestern Australia.

The distribution of species shows striking differences: Whereas some species, as for example *Dentridactylus keyi*, *D. albisignatus*, *Xya smithersi*, and perhaps the Western Australian species at present have extremely narrow ranges, other species, for example *Tridactylus australicus* and *Xya muta* are widely distributed. It is the question now, whether the restricted range of several species depends on limited ecological capacities of the concerned species or rather on biogeographical circumstances, which prevent a further spreading of those species.

1. Genus *Dentridactylus*

Both Australian species of this genus occupy very restricted ranges in southern New South Wales and in the Australian Capital Territory, where they live in montane habitats. According to GÜNTHER (1978) they are found exclusively at light. This habits points to a secretive, hitherto unknown way of life. Perhaps they live in leaf litter on the forest floor or in another rather unusual habitat for *Tridactylus*. Certainly both species are highly specialized with respect to their ecological preferences and their distribution pattern is mainly depending on ecological conditions. These exclusively montane species with strongly restricted ranges are perhaps derived from a common ancestor and they were later separated in different montane refugia.

2. Genus *Tridactylus*

The single Australian species *T. australicus* is widely distributed throughout whole northern tropical Australia. Due to its good flying ability this species was apparently not able to evolve subspecies or to give birth to even new species. Günther states that *T. australicus* is closely related to the widespread *T. fasciatus* Guerin which ranges from North Africa to Southeast Asia. Actually Günther

thinks it possible that *T. australicus* is merely an Australian subspecies of *T. fasciatus*. This would mean that *T. australicus* is a rather recent invader into tropical Australia who was perhaps not yet able to split into separate taxa, but is still moving to the south and west.

3. Genus *Xya*

Like *Tridactylus*, *Xya* is a large genus distributed over the tropical to warm temperate regions of the Old World. The wing reduction of most Australian taxa of this genus was perhaps the reason for the evolution of as many as seven different taxa of close relationships (with exception of *Xya smithersi*).

Of all species *Xya muta* is by far most widely distributed, but this species splits into several well separated subspecies, each occupying an isolated range: *X. m. muta* (eastern Australia), *X. m. deserticola* (Central Australia), and *X. m. signata* (far Northern Territory).

The remaining northern and northwestern species *X. unicolor*, *X. pseudomuta*, and *X. nanutarrae* resemble strongly *X. muta*, but are easily distinguished by their distinct ♂ genitalia. *X. nanutarrae* and to a lesser degree also *X. pseudomuta* have apparently a rather restricted range: they inhabit the two large western faunal refugia, the Hamersley Range area and the Kimberley Division to the south and the north, respectively, of the Great Sandy Desert. *X. unicolor* occurs in whole tropical Northern Territory, in a less distinctive faunal refugium which has, however, some impact on distribution and evolution of species, as for example was shown by MACKERRAS (1968), FREITAG (1979), and BAEHR (1985, 1986, 1987).

For explanation of the origin of these species the history of genus *Xya* in Australia should be known. Since no phylogenetic analysis of the whole genus *Xya* or even the family Tridactylidae has been attempted, no definite suggestions on the history of Tridactylidae in Australia or to the colonization of Australia can be made. It seems reasonable, however, that the main centre of Tridactylidae in Australia was in northeastern Australia. Unfortunately, few is known on the faunas of New Guinea and of the Lesser Sundaic Islands. Hence no comparisons are possible and it is impossible to establish the way on which the original stocks should have colonized Australia. Most probably the northern and both western species are offsprings of a common ancestor who lived in northeastern Australia. After spreading to northwestern Australia during wet periods of the Glaciation epoch (MACKERRAS 1970) the populations in the Kimberley and Hamersley areas were subsequently isolated in the course of warm interglacials and they evolved rapidly to apparently isolated new species. The same happened presumably in *X. unicolor* from Northern Territory. Due to its strong flying ability, however, this species ranges over a larger area.

Unlike *T. australicus* which has a continuous distribution west to Great Sandy Desert, the western *Xya* species evolved presumably rapidly, because their limited flight abilities precluded a genetic interchange, when the climate became drier and their refugia were eventually isolated. Hence the evolution of the western *Xya* species is another hint to the most important role of the northern and northwestern refugia for the faunal diversity of northern Australia.

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